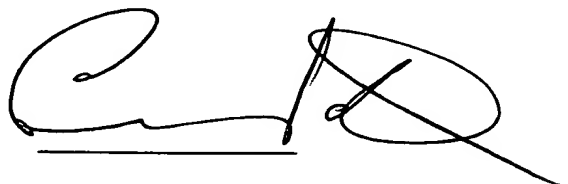


UNITED STATES PATENT AND TRADEMARK OFFICE

I, Susan POTTS BA ACIS,

Director of RWS Group plc, of Europa House, Marsham Way, Gerrards Cross,
Buckinghamshire, England declare;

1. That I am a citizen of the United Kingdom of Great Britain and Northern Ireland.
2. That the translator responsible for the attached translation is well acquainted with the French and English languages.
3. That the attached is, to the best of RWS Group plc knowledge and belief, a true translation into the English language of the specification in French filed with the application for a patent in the U.S.A. on
under the number
4. That I believe that all statements made herein of my own knowledge are true and that all statements made on information and belief are true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the patent application in the United States of America or any patent issuing thereon.



For and on behalf of RWS Group plc

The 13th day of August 2001

OVERVOLTAGE-PROTECTION DEVICE

5 The invention relates to an overvoltage-protection device, applicable in particular to the low-voltage mains.

10 For the protection of a consumer circuit supplied from the low-voltage mains (below 400 V, for example), it is usual to use, between the two lines of a 50 or 60 Hz AC mains, a varistor of metal-oxide type, especially of zinc-oxide type, mounted in series, on the one hand, with a thermal-fuse circuit-breaking element, and, on the other hand, with a gas-discharge arrestor. Figure 1 represents a diagram representative of such a device. Between the lines 1 and 2 of the mains, the right-hand part of which is to be protected against overvoltages, are mounted in series a gas-discharge arrestor 3, a varistor 4 and a thermal-fuse element 5 subjected to the tension from a spring 6 tasked with ensuring effective disconnection after the element 5 blows.

20 Such a device theoretically operates in the following way: the gas-discharge arrestor 3 withstands practically the entire AC voltage of the mains. In effect, the stray capacitance of the arrestor 3 is of a few picofarads whereas the stray capacitance of the varistor 4 is of a few nanofarads. When an overvoltage occurs, it causes the striking of the gas-discharge arrestor 3, which can only be extinguished if the current, called secondary current, which passes through it subsequently becomes sufficiently small. It is the resistance of the varistor 4 which causes the limiting of the secondary current and allows the gas-discharge arrestor 3 to be extinguished.

30 When an overvoltage-protection device has operated a certain number of times, its components reach the end of their lives. In the case of a gas-discharge arrestor, the end of life corresponds to short-circuiting. In contrast, in the case of a varistor, the end of life is manifest as an explosion.

As a safety measure, the gas-discharge arrestor is designed so that its ability to carry away the energy pulses relating to the overvoltages is less than that of the varistor. In this way, it is the gas-discharge arrestor which arrives first at the end of its life and which becomes short-circuited.

The voltage of the mains is then transferred fully onto the varistor 4, which heats up and entails the blowing of the thermal-fuse element 5 and the thermal disconnection, that is to say the placing out of service, of the protection device.

Such a device operates satisfactorily, but only within a limited range of voltages. This is because, in order for the varistor effectively to ensure the extinction of the gas-discharge arrestor, its rated voltage has to be very close to that of the mains. Moreover, if the rated voltage of the varistor is too high, the heating necessary to trigger the thermal disconnection will not be reached and the safety of operation of the device will not be ensured.

The object of the invention is to propose an overvoltage-safety device which can operate in a wide range of voltages, for example between 180 and 330 V, in order to be able to fulfill its role in practically all the countries of the world.

Another object of the invention is to propose an overvoltage-safety device in which the function of extinguishing the gas-discharge arrestor is dissociated from the thermal-disconnection function.

The subject of the invention is an overvoltage-protection device, applicable in particular to the low-voltage mains, comprising, between the two lines of the mains, a gas-discharge arrestor, a varistor and a thermal-fuse element tasked with ensuring the thermal disconnection of the device, characterized in that it includes, in parallel with the varistor, a resistor causing, after the short-circuiting of the gas-discharge arrestor, the heating of the thermal-fuse

element so as to trigger the thermal disconnection of the device.

Advantageously, the overvoltage-protection device is applicable to the low-voltage mains in a wide range of voltages. The varistor is defined so as to extinguish the gas-discharge arrestor up to the maximum voltage of use, and the resistor is defined so as to trigger the thermal disconnection of the device at the minimum voltage of use.

Other characteristics of the invention emerge from the description which follows, given with reference to the attached drawing, in which:

- figure 1 is a diagram representative of an example embodiment of an overvoltage-protection device of known type;

- figure 2 is an exploded view of an embodiment of a group of varistors mounted in parallel;

- figure 3 is a diagram representative of an example embodiment of an overvoltage-protection device according to the invention.

Figure 2 represents an assembly of four varistors 11, 12, 13, 14 mounted in parallel, separated by electrodes 15, 16, 17 and held between two strips 18 and 19. Advantageously, the gas-discharge arrestor is mounted on one of the two strips, and the thermal-fuse element is mounted on the other.

In figure 3, the same elements as in figure 1 bear the same references. According to the invention, a resistor 7 is mounted in parallel with the varistor 4. This resistor has a value of a few hundred ohms, for example 400 ohms.

In the case in which the varistor 4 consists of an assembly of several varistors in parallel, as in figure 2, one of the varistors (11) can be replaced by a resistor 7 of the same dimensions. This resistor 7 may be fixed, or have a negative or positive temperature coefficient. Its purpose is to cause the heating which will trigger the thermal disconnection by way of the thermal-fuse element 5, so as to put the

The first part of the book is devoted to a general discussion of the theory of the firm, and the second part to a more detailed analysis of the theory of the firm. The book is written in a clear and concise style, and is suitable for use as a textbook or as a reference work.

The arranging of the resistor 7 in parallel with the varistor 4 makes it possible to separate the two functions: extinguishing of the gas-discharge arrester, and triggering of the thermal disconnection.

15 Throughout the description, the expression gas-discharge arrestor has been used. This expression also covers the notion of air-gap arrestor, of surge arrestor or of lightning arrestor.